~~THE~~ DETECTING CAPACITY CIRCUIT FOR ~~THE~~ BATTERY

FIELD OF THE INVENTION:

The present invention relates to the field of a detecting capacity circuit for ~~the~~ battery, especially with a function that ~~is allowable~~ to detect the capacity of the battery and ~~it~~ will also be able to cut off the power supply to the electric ~~loop~~ circuit of the drive controlling device automatically ~~while~~ there is a mismatch ~~on~~ ~~the~~ polarities, a short circuit or even over-discharged from a battery.

BACKGROUND OF THE INVENTION:

According to the speedy progress of ~~the~~ modern society, the living standard of ~~the~~ people is improving day by day and the current scientific technology also makes progress at a tremendous pace, ~~and hence a seeking~~ for convenient ~~traffic becomes a common objective by everyone accordingly, and the main purpose is to~~ develop all kinds of transportation vehicles such as bicycle, motorcycle, automobile, train, airplane, vessel etc. ~~and therefore~~ it is a common situation for ~~the~~ people with personal taste in enjoying leisure time to own at least one or even several luxury cars. ~~With the~~ images of free transportation, comfortable inferior decoration, wide-range of fanciful daydream, ~~it makes~~ car become an incredible enjoyment in everyone's mind, ~~therefore it just like~~ a place for taking refuge for the people to run after their favorite models from every kind of media.

~~Only just the~~ car is the most convenient vehicle in the world, ~~in spite of the~~ sedan, wagon...,etc. ~~are all~~ the best thing for ~~the~~ travelling, especially in the hot season in case of no hotel room, ~~to stay~~, your vehicle will ~~then~~ settle the big headache ~~for you accordingly~~.

Even having all kinds of the benefits from ~~the~~ vehicles, ~~the~~ problem of ~~the~~ car-

owners ~~are~~ is that someone might forget to turn off the headlights of the vehicle ~~often~~, or turn on the stereo equipment, fan, or even high beam for a long period of time, and force the battery to over-discharged and hence have it burn down or ~~out of order~~ die. Furthermore the huge current caused by a car accident or short circuit might not only burn down the battery but also caused serious fires etc. ~~all the~~ which tragedies ~~like that was because there is no any~~ could be prevented if there was a device on the vehicles which ~~could have a~~ had the function of auto-cut off. ~~therefore in order to settle the~~ Solving this problem of modern people has become ~~an~~ a very important topic in present-day living.

SUMMARY OF THE INVENTION:

In light of the above matters and based on ~~the~~ good experience in studying and researching ~~in~~ the field of designing and manufacturing ~~the~~ a vehicle's batteries for many years, the inventor has thus created the present invention in order to overcome the known problems of the battery, ~~and~~ so as to achieve a practical effect at the same time.

Therefore, the preferred purpose of the invention is to provide ~~with~~ a detecting ~~capacity~~ capacity circuit for ~~the~~ a battery ~~especially with a function that is allowable to detect~~ that allows detection of the capacity of the battery and ~~hence to~~ cut off the power supply ~~at the time while~~ when the ~~capacity in~~ capacity battery is either insufficient or ~~overflow~~ the battery is overcharged.

~~And the~~ According to another preferred purpose of the present invention is to supply a ~~kind of~~ detecting capacity circuit for ~~the~~ a battery ~~with~~ that has a simple structure and a special function ~~in~~ of detecting the capacity ~~display~~ under ~~the~~ different loading conditions.

Thus, according to an embodiment of the invention, it is desired to provide a detecting capacity circuit for ~~the~~ a battery that comprises ~~one set of~~ a voltage detecting circuit, ~~one set of~~ a current detecting circuit, ~~one set of~~ a switching circuit, ~~one set of~~ a capacity display circuit, ~~one set of~~ a timing circuit, and ~~one set of~~ a driving circuit etc. ~~and in~~ which are all fixed onto appropriate positions of the battery, ~~therein the~~ The current detecting circuit and voltage detecting circuit are installed ~~at the same time~~ in parallel, and the switching circuit is actually one kind of electronic switch and is installed at

~~the~~ position between the current detecting circuit and capacity display circuit, ~~and~~ the capacity display circuit comprises more than one set of LED and resistance, ~~the~~ design for timing circuit is to add and install a timing loop circuit ~~onto to~~ the voltage detecting circuit and furthermore in the ~~structure of~~ driving circuit there is also an extra driving loop circuit which is installed onto the voltage detecting circuit.

An embodiment of the present invention will now be described by way of example with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE ILLUSTRATIONS:

Figure 1 is a sketch-map for the current circuit wiring of the present invention.

Figure 2 is a block diagram of the present invention.

Figure 3 is a flow chart of the present invention.

Figure 4 is a 4051B Truth Table in common use.

BRIEF DESCRIPTION OF THE SYMBOLS:

10	Voltage detecting circuit	RL1~RL6	Resistance
11	Current detecting circuit	R51~R54	Resistance
12	Switching circuit	R61~R64	Resistance
13	Capacity display circuit	R71~R74	Resistance
14	Timing circuit	R81~R84	Resistance
15	Driving circuit	R91~R94	Resistance
16	Manual switch	R101~R104	Resistance
A01~A10	Operational amplifier	X0	No-loading
V01~V10	The input-port of	X1	Light-loading
	Operational amplifier	X3	Heavy-loading
VC0,VC1	The input-port of	X4	Over-loading

	Operational amplifier	INH	Whether the switching circuit
Vref1	Constant voltage		is acting
Vref2	Reference voltage	LED1~LED9	Lamp set
Z1~Z2	Zener diode	C1*R2	Timing loop circuit
R1~R6	Resistance	A,B,C 4051B	output control
R01~R02	Resistance	D1~D13	Diode
R21~R22	Resistance	I/O 4051B	Input/Output
R31~R32	Resistance		
R41~R42	Resistance		
RF	Resistance		

DETAILED DESCRIPTION:

Firstly, with reference to both Figures 1 and 2, the present invention ~~which~~ ~~includes~~ is a capacity detecting circuit for ~~the~~ a battery, ~~comprises one set of~~ including a voltage detecting circuit 10, ~~one set of~~ a current detecting circuit 11, ~~one set of~~ a switching circuit 12, ~~one set of~~ a capacity display circuit 13, ~~one set of~~ a timing circuit 14, and also ~~one set of~~ a driving circuit 15 etc.; ~~and among which:~~

By utilizing the ~~enlarging effect from~~ an Operational Amplifier A0, the voltage detecting circuit 10 will analysis the energy by comparing it with ~~the value~~ an output voltage value and then ~~it~~ will prohibit the voltage from being supplied to a ~~supplying to~~ controlling device if the value of the output voltage is lower than the protection voltage, ~~and which are~~ according to the following details:

(1) Resistance R5 and constant voltage diode (Zener diode) Z1 will provide ~~with~~ a constant operating voltage Vref1 for a battery connected between terminals

(2) Resistance R6 and constant voltage diode (Zener diode) Z2 will provide a constant reference ~~with a constant~~ voltage Vref2.

(3) When the value of V01 is larger than the value of reference voltage Vref2, ~~it means that~~ the actual voltage of battery is higher than the value of protection voltage so that the ~~relative~~ circuit is in normal operating condition. (V01 utilized the voltage divided from both resistance R01 and R02.)

(4) At the time ~~while~~ the value of V01 is smaller than the value of reference voltage Vref2, ~~it means that~~ the voltage of battery is lower than the value of protection voltage so that it will cut off the load~~ing operation~~ automatically. (V01 utilized the voltage divided from both resistance R01 and R02.)

Furthermore, the current detecting circuit 11 and voltage detecting circuit 10 are installed ~~at the same time~~, so it will provide the necessary current signals ~~while~~ the battery is under the condition of checking the ~~relative~~ circuit, and proceeding ~~the~~ operation ~~on~~ constant current controlling procedure, ~~and besides it will~~ utilize ~~the~~ Hall Effect current sensor together with an isolated function in order to get the necessary current signals without ~~interfering the~~ controlling circuit ~~with~~ electric power circuit while the said battery is under discharging condition, ~~thereby, supposed the~~ value of rated current is 100 ampere and the ratio of the winding coils is 1/1000, ~~and~~ if ~~there is~~ a current of 1 ampere passes through the one time winding coil unit, then ~~in this way it will create~~ a current of 0.001 ampere ~~at the end of two times~~ ~~winding~~ coil unit. ~~Moreover while~~ the current passes through a resistance of 100 ohm which is connected serially to the ~~two times winding~~ coil unit ~~and it will then provide a~~ voltage of 0.1 volt accordingly; ~~after combining with a function of enlarging effect which~~ is provided ~~from an~~ Operational Amplifier (AF=(R4+RF)/R4), ~~so that~~ the current sensor will be able to measure the value of voltage ~~in~~ corresponding ~~to the~~ value of current and then the current detecting circuit 12

will utilize Operational Amplifier A1 to create a direct current VC1 with same effective value, ~~and then it~~ will be transferred into a current grading circuit for grading and ~~analyzing further~~.(such as 10 ampere, 20 ampere, 50 ampere...):

1. At the time ~~while~~ the value of current is less than 10 ampere, ~~then~~ the Operational Amplifier A2 will output a signal of "-", and Operational Amplifier A3 will output a signal of "-" as well;
2. At the time ~~while~~ the value of current is between 10 ampere and 20 ampere, ~~then~~ the Operational Amplifier A2 will output a signal "+", and Operational Amplifier A3 will output a signal of "-" instead;
3. At the time ~~while~~ the value of current is up to 20 ampere, ~~then~~ the Operational Amplifier A2 will output a signal of "+", and Operational Amplifier A3 will output a signal of "+" as well;
4. At the time ~~while~~ the value of current ~~is~~ reach 50 ampere, then the Operational Amplifier A4 will output a signal of "-", and hence it will cut off the power supply automatically from the battery to the drive controlling device ~~which is loaded~~.

The switching circuit 12 installed ~~on~~ a position between the current detecting circuit 11 and the capacity display circuit 13 is actually ~~one kind of electronic switch (Multi plexers), in which, it consists of~~ no-load~~ing~~ X0, light-load~~ing~~ X1, heavy-load~~ing~~ X3 together with the corresponding lamp sets ~~of~~ LED7, LED8, LED9, (Please also refer to ~~the~~ Figure 4 the 4051 Truth Table):

1. At the time ~~while~~ the value of current is less than 10 ampere, ~~the~~ A="-", B="-", ~~then~~ no-load~~ing~~ X0="+", thus LED7 will turn on automatically;
2. At the time ~~while~~ the value of current is between 10 ampere and 20 ampere, ~~the~~ A="+", B="-", ~~then~~ light-load~~ing~~ X1="+", thus LED8 will turn on automatically;

3. At the time ~~while~~ the value of current is between 10 ampere and 50 ampere, ~~the~~ A="+", B="+", ~~then~~ heavy-loading X3="+", thus LED9 will turn on automatically;

4. At the time ~~while~~ the signals of no-loading X0, light-loading X1, and heavy-loading X3 are all ~~show~~ "+", then all the LED7, LED8, LED9 lamp ~~sets~~ turn on, ~~and it means~~ that the value of current is still within the normal range;

5. At the time ~~while~~ the value of current is over 50 ampere, ~~the~~ A4 shows "-", ~~it means~~ there is a condition of over-loading ~~X4~~, so that the battery will cut off the power supply for driving the controlling device automatically.

The capacity display circuit comprises more than one ~~set of~~ LED and resistance, and under ~~the~~ different loading conditions, ~~it~~ will ~~compare with~~ switching circuit 12 for the status of no-loading X0, light-loading X1 and heavy-loading X3, and ~~thus~~ after the value of the voltage in battery has been divided ~~it~~ will ~~result in the~~ divided voltage with different impedance ~~to be~~ corresponded ~~to each~~ input port ~~of~~ V05, V06, V07, V08, V09, V10 located on each Operational Amplifier A5, A6, A7, A8, A9, A10 ~~accordingly (it means the voltage of~~ V05~V10~~)~~ as follows:

1. At the time ~~while~~ the value of V05 is less than the reference voltage Vref2, ~~then the relative~~ LED1 will turn on a red lamp signal in order to send a message of warning that the capacity in battery is insufficient and ~~thus it will prohibit~~ the discharging operation ~~from the battery~~ accordingly;

2. At the time ~~while~~ the value of V05 is larger than the reference voltage Vref2, ~~then the relative~~ LED1 will turn off ~~and it means~~ that the capacity in battery is probably sufficient and thus it will be necessary to observe the status of LED2 in order to confirm whether the battery ~~is sufficient for the~~ capacity;

3. At the time ~~while~~ the value of V06 is larger than the reference voltage Vref2,

~~then the relative~~ LED2 will turn on a yellow lamp signal in order to indicate a warning that the capacity in the battery is on the edge of draining off very soon;

4. At the time ~~while~~ the value of V06 is less than the reference voltage Vref2, ~~then the relative~~ LED2 will not light up any signal ~~and it means~~ to indicate that the battery needs to be charged soon;

5. At the time ~~while~~ the value of V07 is larger than the reference voltage Vref2, ~~then the relative~~ LED3 will turn on a green lamp signal in order to show that the capacity ~~in~~ of the battery is sufficient ~~at all~~;

6. At the time ~~while~~ the value of V07 is less than the reference voltage Vref2, ~~then the relative~~ LED3 will not light up, ~~any signal and it means~~ thereby indicating that the capacity in the battery will drain off soon;

7. Same as the above condition (5), at the time ~~while~~ the value of V08, V09, V10 are all larger than the reference voltage Vref2, ~~then all the relative lamp~~ lamps LED3, LED4, LED5, LED6 will all turn on green lamp signals in order to indicate that the capacity in the battery is quite sufficient (The more lamps light up the more sufficient capacity it has);

8. Same as the above condition (6), at the time ~~while~~ the value of V08, V09, V10 are all smaller than the reference voltage Vref2, ~~then all the relative~~ lamps LED3, LED4, LED5, LED6 will not light up any signal ~~and it means~~ thereby indicating that the capacity in the battery is insufficient;

In light of the above, it is very easy to ~~justify~~ determine whether the capacity in the battery is sufficient just by observing the status of LED1, LED2, LED3, LED4, LED5 and also LED6; and furthermore the capacity display circuit 13 ~~is~~ also ~~allowable to~~ may be operated manually in order to observe the capacity of the battery while it is under different loading conditions.

The design for timing circuit 14 is to add and install a timing loop circuit C1*R2 ~~on~~ in the voltage detecting circuit 10, ~~therein the~~ The timing circuit 14 is installed with the ~~said~~ voltage detecting circuit 10 and current detecting circuit 11 at the same time, i.e. in parallel and ~~hence while there is~~ thus when a voltage V01 is input into the system (V01 utilizes the voltage divided from the resistance R01, R02), and ~~if~~ the voltage of the battery is higher than the reference voltage Vref2, ~~it will connect successfully, but on the contrary, while~~ the battery will be connected, but when the setting time is over ~~but~~ and the voltage of the battery is ~~still~~ lower than the reference voltage Vref2, ~~so that~~ the battery will cut off the power supply for driving the controlling device automatically.

1. Similar to the above, in the structure of driving circuit 15 there is also an extra driving loop circuit which is installed ~~onto~~ in the voltage detecting circuit 10, ~~wherein~~ So that the driving circuit 15 is installed with the ~~said~~ voltage detecting circuit 10 and current detecting circuit 11 at the same time; and hence ~~while~~ the voltage of the battery is less than the reference voltage Vref2, ~~thus~~ the battery will cut off the power supply ~~loop~~ circuit for driving the controlling device ~~automatically while~~ when the setting time on timing circuit 14 is ~~over or at the time while~~ equalled or exceeded and the current detecting circuit 11 is detecting the output on A4 ~~is~~ as "-" (~~it~~ which means the status of current is abnormal).

In view of the above, preferably all ~~the relative~~ of the respective configurations for the circuits installed according to the present invention are fixed properly onto the battery.

Finally, relying on the above structure and with reference to ~~the~~ Figure 3 which is a flow chart for the present invention, ~~in details as followings~~ the following functions may be carried out:

1. ~~with~~ according to the special functions ~~provided from~~ set by the present invention, the voltage detecting circuit 10 will detect the battery automatically and try to find out whether the voltage in the battery is in a normal condition or not:

(1) At the time ~~whenever~~ voltage detecting circuit 10 detects ~~with~~ that a value of voltage ~~which~~ is much lower than the normal value(or a status of breakdown while it is abnormal), then it will switch into timing circuit 14, and hence stop the power supply at once if it is over the setting time, ~~but it~~ or will supply the power accordingly only after ~~it is~~ the voltage value reverts to a normal condition.

(2) At the time ~~while~~ voltage detecting circuit 10 detects ~~with~~ a normal condition, then the current detecting circuit 11 will force the driving circuit 15 to detect the status of the current automatically.

2. ~~Supposed it is over~~ When the setting time on the timing circuit 14 has elapsed, the power supply will be stopped at once, and then ~~it~~ will return to voltage detecting circuit 10 system ~~while~~ once it has reverted properly.

3. ~~With a function from~~ The current detecting circuit 11, ~~it~~ is able to treat the current into different grades such as no-load~~ing X0~~, light-load~~ing X1~~, heavy-load~~ing X3~~ and over-load~~ing X4 etc~~, as follows:

(1) ~~At~~ the time ~~while~~ the status of the current is overflow, ~~it~~ the current detecting circuit will be able to test automatically whether it is allowable to supply the power again, ~~but instead it~~ will switch into the timing circuit 14 if it has determined that it is still not suitable, and also ~~it~~ will stop supplying the power ~~while~~ when it is over the setting time, but ~~it~~ will supply the power again ~~while~~ when it has reverted properly.

(2) At the time ~~while~~ everything is in normal status, then the current detecting circuit 11 will drive capacity display circuit 13 by means of switching circuit 13.

4. ~~It~~ set, it is ~~available~~ possible to find out whether the capacity in the battery is sufficient or not in order to supply the power just by means of the capacity display circuit 13.

Preferably, with the special function ~~form~~ the present invention ~~of detecting capacity circuit for the battery, it is allowable to~~ detect the exact capacity in the battery, and hence it is very easy for the user to find out whether the capacity in the battery is sufficient or not. Furthermore, ~~it~~ will isolate both the battery and ~~loading properly while~~ it is mismatched in ~~the polarities~~, in a condition of short circuit, or even ~~while it is over-discharged from a~~ battery.

~~In view of the specific embodiment described herein,~~ while particular embodiment of the present invention has been illustrated and described, it would be obvious to those skilled in the art that various other changes and modifications can be made without departing from the spirit and scope of the invention. It is therefore intended to cover in the appended claims all such changes and modifications that are within the scope of the present invention.

ABSTRACT:

A detecting capacity circuit for the battery which comprises one set of voltage detecting circuit, one set of current detecting circuit, one set of switching circuit, one set of capacity display circuit, one set of timing circuit and one set of driving circuit etc.; among which, the above circuits are all fixed on the appropriate positions of the battery, and under the multiple-loaded circumstances if the battery do have the special functions of present invention it will not only be allowable to detect it's capacity but also be able to properly isolate both the battery and the loading while there is a mismatch on the polarities, a short circuit, or even over-discharged from a battery.

Figure 1

Figure 2

Battery Voltage detecting circuit Capacity display circuit Driving circuit

Current detecting circuit Timing circuit

Switching circuit

Figure 3

Starting

Voltage detecting circuit detecting on the low voltage

Driving circuit

Current detecting circuit the current is overflow

Timing circuit

to grade the current the setting time is over

Switching circuit

Capacity display circuit insufficient voltage

stop power supply

Continue to supply the power revert